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| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
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09/435,766

11/08/1999

TOMOYOSHI KUSHIDA

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11/18/2003

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EXAMINER

LOKE, STEVEN HO YIN

ART UNIT

PAPER NUMBER

2811

DATE MAILED: 11/18/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/435,766

Applicant(s)

KUSHIDA, TOMOYOSHI

Examiner

Steven Loke

Art Unit

2811

-- The MAILING DATE of this communication appears on the cover sheet with the corresponding address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 03 September 2003.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1,4,12 and 20-34 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 1,4,20,21 and 31 is/are allowed.
- 6) ☒ Claim(s) 12,22-30 and 32-34 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 03 September 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. §§ 119 and 120

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
* See the attached detailed Office action for a list of the certified copies not received.
- 13) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application) since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.
a) ☐ The translation of the foreign language provisional application has been received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121 since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892) 4) ☐ Interview Summary (PTO-413) Paper No(s). _____
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948) 5) ☐ Notice of Informal Patent Application (PTO-152)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ 6) ☐ Other: _____

1. Claims 12, 22-30 and 32-34 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

Fig. 10B discloses a p⁻ type channel [215] formed between the gate electrode [218] and between the n-type drift region [214] and the source region [220]. The specification never discloses an impurity concentration of the channel region is equal to an impurity concentration in the drift region, and a depletion layer forms over the entire channel region sandwiched between the gate region when a zero bias is applied to the gate region as claimed in claim 12.

The specification never discloses the embodiment of fig. 10B includes a gate region of the first conductive type as claimed in claim 22.

The specification never discloses the embodiment of fig. 10B includes at least a part of the source electrode forms a Schottky junction with the channel region as claimed in claims 24 and 25.

The specification never discloses the embodiment of fig. 10B includes a semiconductor layer having one of the first and second conductive types located between the source region and the source electrode, and the semiconductor layer including an end face extended to a position covering at least a portion of the gate region as claimed in claim 26.

The specification (page 10, line 24 to page 11, line 5) discloses the embodiment of fig. 14B having a p-type second anode region [542], an n-type first cathode region [532], an n-type second cathode region [534] and an n-type first anode region [537]. The specification never discloses a second anode region having the first conductive type as claimed in claim 30.

The specification never discloses an impurity concentration of the channel region is less than an impurity concentration in the drift region as claimed in claims 32 and 33.

The specification never discloses a depletion layer forms over the entire channel region sandwiched between the gate region when a zero bias is applied to the gate region as claimed in claim 34.

2. Applicant's arguments filed 9/3/03 have been fully considered but they are not persuasive.

It is urged, in page 10 of the remarks, that the first embodiment discloses a semiconductor device in which an impurity concentration of the channel region is less than an impurity concentration in the drift region. However, the specification never discloses the first embodiment discloses a semiconductor device in which an impurity concentration of the channel region is less than an impurity concentration in the drift region.

It is urged, in page 11 of the remarks, that the third embodiment differs from the first or second embodiment in that a source region 220 is formed at almost a center of a p-type channel region 215. It is also urged that the third embodiment includes the same construction as the first or second embodiment. However, the specification never

discloses the third embodiment includes the same construction as the first or second embodiment other than the source region [220]. Therefore, it is believed that claim 12 is not supported by the original specification.

It is urged, in page 11 of the remarks, that the gate region may be n-type (page 4, line 4), or may be p-type (page 5, line 17). However, the original specification never discloses the conductivity type of the gate region of the embodiment of Fig. 10B. Therefore, it is believed that claim 22 is not supported by the original specification.

It is urged, in pages 11-12 of the remarks, that the third embodiment also includes the same or similar construction as the first embodiment or the other. However, the specification never discloses the third embodiment includes the same construction as the first or other embodiment other than the source region [220]. Therefore, it is believed that claims 24 and 25 are not supported by the original specification.

3. Applicant's arguments with respect to claims 26 and 30 have been considered but are moot in view of the new ground(s) of rejection.

4. Claims 1, 4, 20, 21 and 31 are allowed.

5. The following is a statement of reasons for the indication of allowable subject matter: The major difference in the claims not found in the prior art of record is a semiconductor device having an impurity concentration in the first anode region is low to effect pinch off of the first anode region when a reverse bias is applied to the trench structure.

6. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP

§ 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Steven Loke whose telephone number is (703) 308-4920. The examiner can normally be reached on 7:50 am to 5:20 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Eddie Lee can be reached on (703) 308-1690. The fax phone number for the organization where this application or proceeding is assigned is (703) 308-7722.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.

sl
November 14, 2003

A handwritten signature in cursive script, reading "Steven Loke".